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of Candelaria which accords well with the reports that it passed directly over this point, but these observations are not sufficiently accurate to determine its longitude. Mr. FORBUSH's observations would indicate that it fell about the center of the San Joaquin Valley to the east of the LICK Observatory, but this is improbable. It probably fell in the wild and uninhabited mountains to the west of Candelaria, Nev., and may never be located. Searching parties went out stimulated by the rewards offered, but, up to the present time, no report of any find has been received.

C. D. PERRINE.

MOUNT HAMILTON, March 5, 1894.

A LETTER FROM PROFESSOR NEWTON ON THE CANDELARIA
METEOR OF FEBRUARY 1, 1894.

“MY DEAR PROFESSOR HOLDEN :

“I am very much obliged to you for the advance manuscript copy of Mr. PERRINE's interesting report of observations of the Candelaria meteor of February 1, and for your invitation to add thereto, if I wish, comments of my own. The accounts are conflicting, as Mr. PERRINE says, and they cannot all be satisfied by any assigned path of the meteor. This is usually the case with meteor observations, and attempts to reconcile conflicting statements are often an entire failure. Men frequently combine what they *see* of the meteor path with what they *infer* about it in such manner that we cannot separate the two. But I think some trustworthy and valuable conclusions can be gotten from the accounts so carefully collected by Mr. PERRINE, and the meteor was of such an extraordinary character that it is worth while to deduce all we can from the stories. Allow me first, however, to add thereto an interesting account of the meteor, taken from a letter to me from Mr. CHARLES A. KING of Candelaria. He says :

“‘I will describe what I saw and heard. I live at the railroad depot, a mile from town and 500 feet above it. At 10^h 7^m P. M. (railroad time), February 1, sky clear and cloudless, thermometer 16° above zero, a brilliant white flash of light coming from the west illuminated the whole sky. So bright was it that the flame of a lamp by which I was reading appeared dim as it would in sunlight. As near as I could judge, ten seconds after the flash was a deafening explosion, of a crashing, tearing nature, but very brief. This was followed by a rumbling sound resembling a train.

of cars traveling rapidly, with a regular, intermittent break in the noise, like that caused by a flat place in a car wheel striking the rail each revolution. The rumbling lasted at least two minutes, gradually decreasing in intensity as it passed away to the east. No one about here seems to have seen the approach of the meteor. In the opinion of some people who were out of doors, the color of the flash was a pale blue; others say it was violet; while those inside of buildings unite in declaring it white. Some seconds before we heard the bursting the light had ceased, and all was in darkness.

“‘The symptoms in some respects resembled those of earthquakes. Everything loose, such as dishes, etc., rattled. The house appeared to shake violently, and to rise a little way, say an inch or so, vertically, then come down with a ‘thud.’ But there was none of that wavy motion common to quakes. I did not feel the slight nausea or squeamishness I had always experienced hitherto on such occasions, and a dog I have had for several years which always betrays great uneasiness before an earthquake, and after the shock is over runs about barking loudly, was on that night lying quietly at my feet, but after the explosion cowered away in a corner and trembled violently, and for hours after trembled all over.’

“We may, I think, safely make the following deductions from the several accounts :

“*First.*—The meteor finally disappeared, with explosion, *not far from Candelaria*. The detonations heard at Candelaria, Belleville and Soda Springs, locate the explosion in the vicinity of those places. The hissing sound reported as heard at Virginia City is questionable, inasmuch as the meteor was so distant that no ordinary sound could reach Virginia City till ten or fifteen minutes after the meteor disappeared. At Bishop’s Creek, the faint rumbling, if it came from the meteor at all, implies considerable distance. At most other places no sound was reported.

“*Second.*—The time named for the duration of the interval from the extinction of the meteor’s light to the hearing of the first and loudest explosion measure the distance from Candelaria, Belleville, etc. Sound travels about 12 miles a minute. Mr. KING says the interval was ten seconds, which means a distance of 2 miles from Candelaria. Mr. ASHLEY says it was thirty seconds, which means 6 miles from him to the place of explosion. A newspaper account gives two minutes for the interval at Belle-

ville, which represents a distance of 24 miles, also thirty-six seconds at Candelaria, or 6 miles. The general consensus is that the meteor came down westwardly from those places. I believe that we may safely assume that the sound of the explosion first heard came from a point 5 miles, more or less, westwardly from Candelaria and Belleville. The height is not definitely given by any of the observations, but it may easily have been 2 or 3 miles, or more, from the ground, and all the stories be well represented. I assume that the fact that the explosion was near Candelaria is so well established that all other observed paths must be adjusted to this ending of the luminous path.

“*Third — The meteor was moving from the east, and was descending at a large angle, both to the vertical and to the horizon.* Professor TREAT was about 200 miles due west of the meteor, and its observed path was to him vertical. This limits the path to an east and west plane, and that plane can vary from the vertical only to the admissible limits of error in Professor TREAT’s observation. Mr. PERRINE was 200 miles south 75° west from the place of explosion. I assume that the meteor disappeared to him close to the horizon in the azimuth north 75° east, and that its *apparent* path produced backward, since it came from the direction of *Leo*, was inclined say 10° or 15° to the vertical. The intersection of the vertical path seen by Professor TREAT and this inclined path taken strictly determines the meteor’s *quit*. Unfortunately, they do not fix its altitude in the east with desired accuracy. They do show, however, that the meteor was rapidly descending. The *quit* was manifestly considerably above the highest point in the visible paths as seen by Professor TREAT and Mr. PERRINE. But I feel sure that Mr. PERRINE has overestimated the first altitude, which could not have been “ 35° or 40° .” Such overestimation of altitudes is usual. The actual altitude at first appearance may safely be assumed as less than 100 miles, and as the body was then $250 \pm$ miles distant the apparent altitude to Mr. PERRINE may be taken as not over 20° to 25° . I think that the two observations, and that of Professor KEEP, imply a *quit* nearly due east, at least as high as 40° .

“On the other hand, Mr. FORBUSH’s statement that the meteor moved, as seen from Santa Barbara, from east to west, implies a considerable angle with the vertical. Mr. SWINDELL’s account clearly requires such motion. Mr. KING says it passed from west

to east, but he was in the house, and may have been misled by the fact that the sounds were first heard in the west but appeared to die away in the east. This inverted order would result from a series of sounds coming from different points of the meteor's path, the more distant sounds coming last.

"*Fourth.*—By reference to a celestial globe, it will be seen that if we draw a line from Lat. $+ 15^{\circ}$, Long. 125° to Lat. $+ 15^{\circ}$, Long. 155° the meteor's *quit* may be regarded as not very far from some point in this line. The zenithal attraction will be nearly along this line, and so may be disregarded. The earth's *quit* was in Long. 43° in the ecliptic. The meteor's *absolute quit* would be between its *relative quit* above described and the earth's *quit*, say in the constellation *Gemini*, and 10° or 15° north of the ecliptic. The meteor body was therefore at its descending node, and its orbit had a small inclination to the ecliptic. It had not passed perihelion.

"Yours most truly, H. A. NEWTON."

YALE COLLEGE,

NEW HAVEN, Conn., April 4, 1894.

NEW ASTRONOMICAL STATION FOR HARVARD UNIVERSITY.

CAMBRIDGE, Mass., February 12, 1894.

It was announced this afternoon that on March 1, Harvard University Observatory will start an expedition to Arizona to locate a new observatory station. Such a station has been the plan of Professor PICKERING for years, but he has never before had the necessary financial backing.

PERCIVAL LOWELL of Boston has just donated a large fund for this purpose, and Mr. LOWELL will go as a member of the party. A. E. DOUGLASS, assistant in the Cambridge Observatory, will leave before the other members of the expedition in order to make experiments.

WILLIAM PICKERING, who led the Harvard expedition into Peru, will manage this work.

The station in Arizona will be for visual investigation, as the Harvard station in Arequipa, Peru, is for photographic purposes. This will give the Cambridge Observatory two of the best locations in the world. The great BRUCE photographic telescope now being tested will be shipped to Peru. It will be the largest of its kind in use.—S. F. *Chronicle*.